

# Guidelines and Indicators for Sustainable Mega-Event-Buildings

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## Sport Facilities leave Marks

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**Legacy of Venues: Some Centuries ago**

City of Lucca in Italy (Tuscany)

Re-Use of the Colosseum: City Center

## Sport Facilities leave Marks

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### Legacy of Venues: Today

Fan-housing area in the stadium (Deconstruction 1998)

Re-use of the Osaka Stadium of the Japanese Nankai Hawks Baseball Teams

Source: mellowmonk + fudoki



Construction Site of the „Olympic Green“ for the Beijing 2008 Games

### **Gigantism and Mega-Construction Sites “Olympic Games”:**

Biggest building project in the history of the Olympic Cities in a time-frame of 7 years

## Sports and Environment: Development

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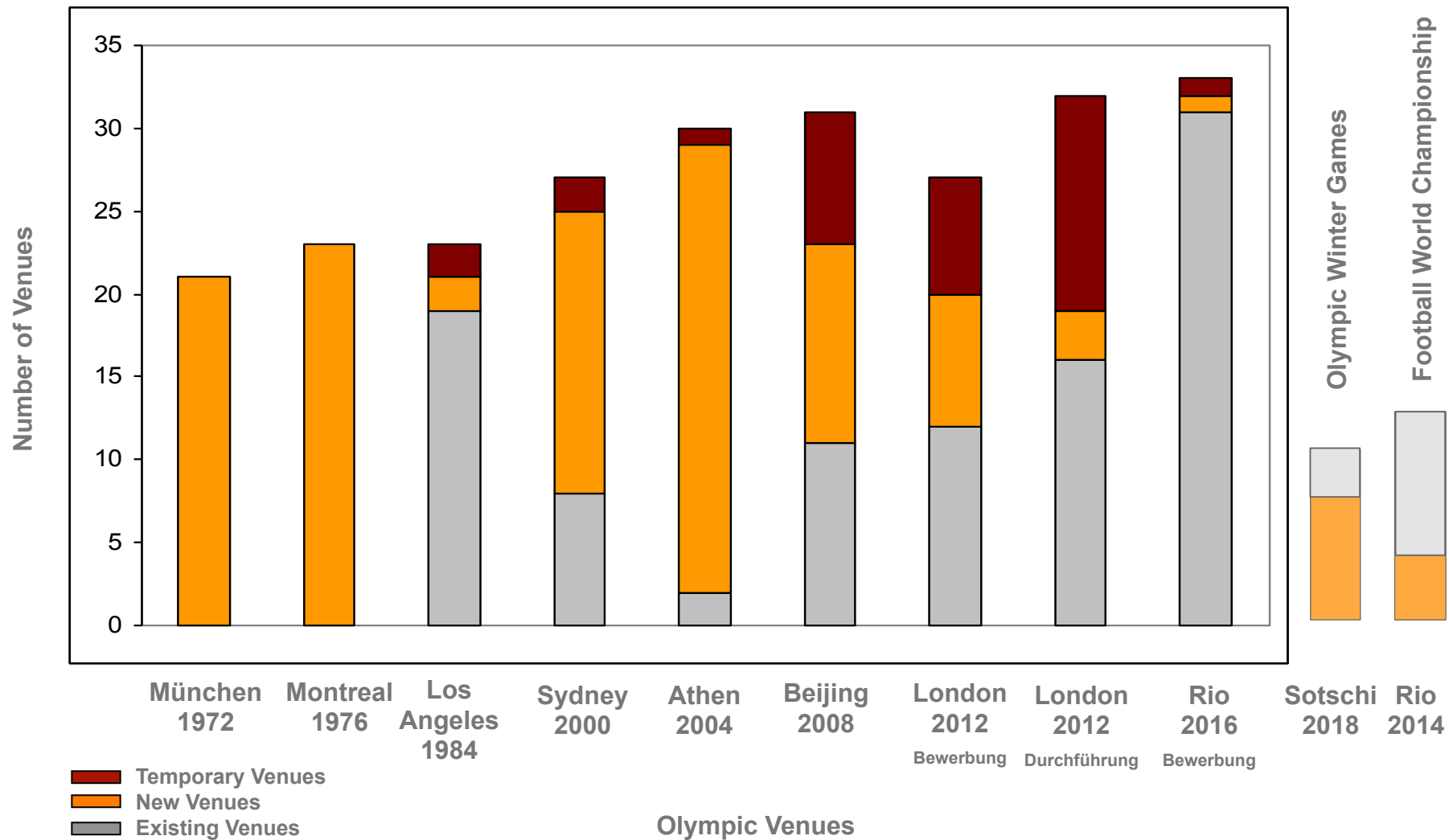
### **Olympic Games Lake Placid 1932:**

First „Environmental protests“ against Olympic venue constructions and implementation of environmental laws by Olympic Games

# Increase of Mega-Event Buildings – Example Olympic Summer Games

## Number of Venues

### Olympic Venues (Summer Games)



# „Olympic Games Legacy“

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## Instrument for Urban and Regional Development



Barcelona before and after the Olympic Summer Games 1992

### Olympic Legacy:

Olympic Games Barcelona (1992): „Opening the City to the Sea“ – Revitalisation of an Industrial Brownfield

## Lack of Re-Use Concepts/ Legacy

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### „White Elephants“: Vacancy and Enormous Life-Cycle-Costs



Olympic Park Sydney (2000)

#### Olympic Legacy:

Olympic Games Sydney (2000): „Olympic Park“ – planned for the Mega-Event and not for the re-use

## Lack of Re-Use Concepts/ Legacy

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„White Elephants“: Vacancy and Enormous Life-Cycle-Costs



Olympic Park Athen (2004)

### Olympic Legacy

Olympic Games Athen (2004): „Ghost City“ Olympic Park

## Lack of Re-Use Concepts/ Legacy

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**„White Elephants“: Vacancy and Enormous Life-Cycle-Costs**



**Legacy of European Football Championship:**

Portugal 2004: Stadion Avareiro Municipal – Re-use/ Demolition?

## Lack of Re-Use Concepts/ Legacy

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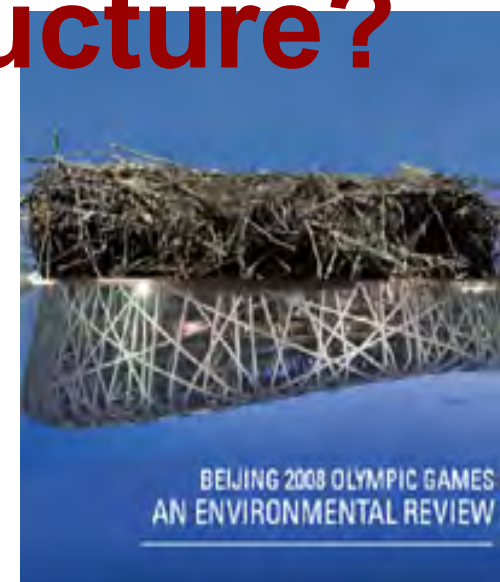
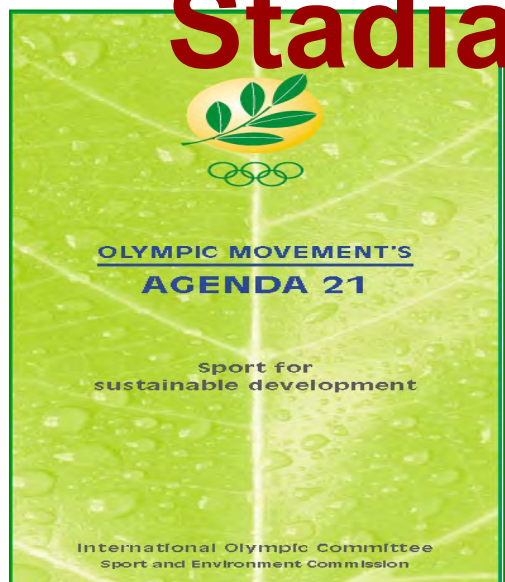
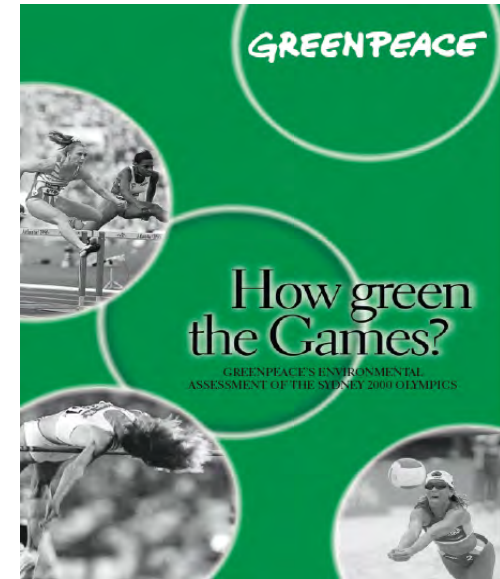
„White Elephants“: Vacancy and Enormous Life-Cycle-Costs



**Legacy of Expos:**

Expo Hannover 2000: Pavillon of the Netherlands – Re-Use?

## Environment Assessment Methods of NGOs, FIFA, UEFA and IOC



# Stadia and Infrastructure?

# Sustainable Performance of Buildings - International

## Certification and Assessment Methods for Buildings



## BREEAM: London Olympic Games 2012

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### Assessment of all Olympic Venues with Breeam for Olympic Park and Venues



breeam



# LEED: World Football Championship 2014 and Olympic Games 2016 Brazil

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## Assessment of the Stadia with the American LEED System



**Example: Maracana Stadium in Rio de Janeiro**

Total Renovation

# Research: Sustainable Buildings and Mega-Events

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## Research Project: „Guidelines for Sustainable Mega-Event-Buildings“



- **Client:** INS
- **Timeframe:** September 2011 to Januar 2013
- **Intent:** Criteria for sustainable buildings of Mega-Events
- **In cooperation with:** DOSB, IAKS, gmp, PROPROJEKT, IOC, FIFA, Ökoinstitut etc.

## Basis: EU Research Project OPEN HOUSE

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- EU-Project of the 7th EU Framework (Timeframe: 2/2010 - 2/2013)
- Project Coordinator: Acciona, Scientific Coordinator: Fraunhofer IBP
- **Bottom-up-Ansatz:** Development of an European Assessment Method based on existing methodologies and indicators, standards and national and international initiatives and research projects

## Differences between Assessment Methods

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- **Assessment methods of the 1<sup>st</sup> generation:**

Environmental and energy-efficient approach:

*„Green-Building-Approach“*

Example: BREEAM, LEED, HQE etc.

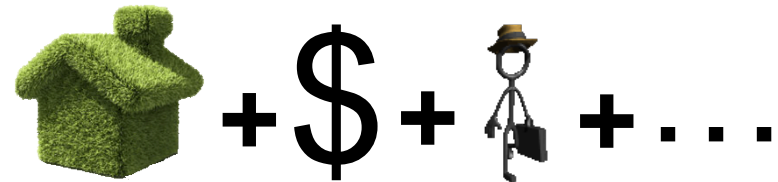


- **Assessment methods of the 2<sup>nd</sup> generation:**

Life-cycle-orientated approach based on sustainability pillars:

*„Sustainable-Building-Approach“*

Example: DGNB



- **Assessment method of the 3<sup>rd</sup> generation:**



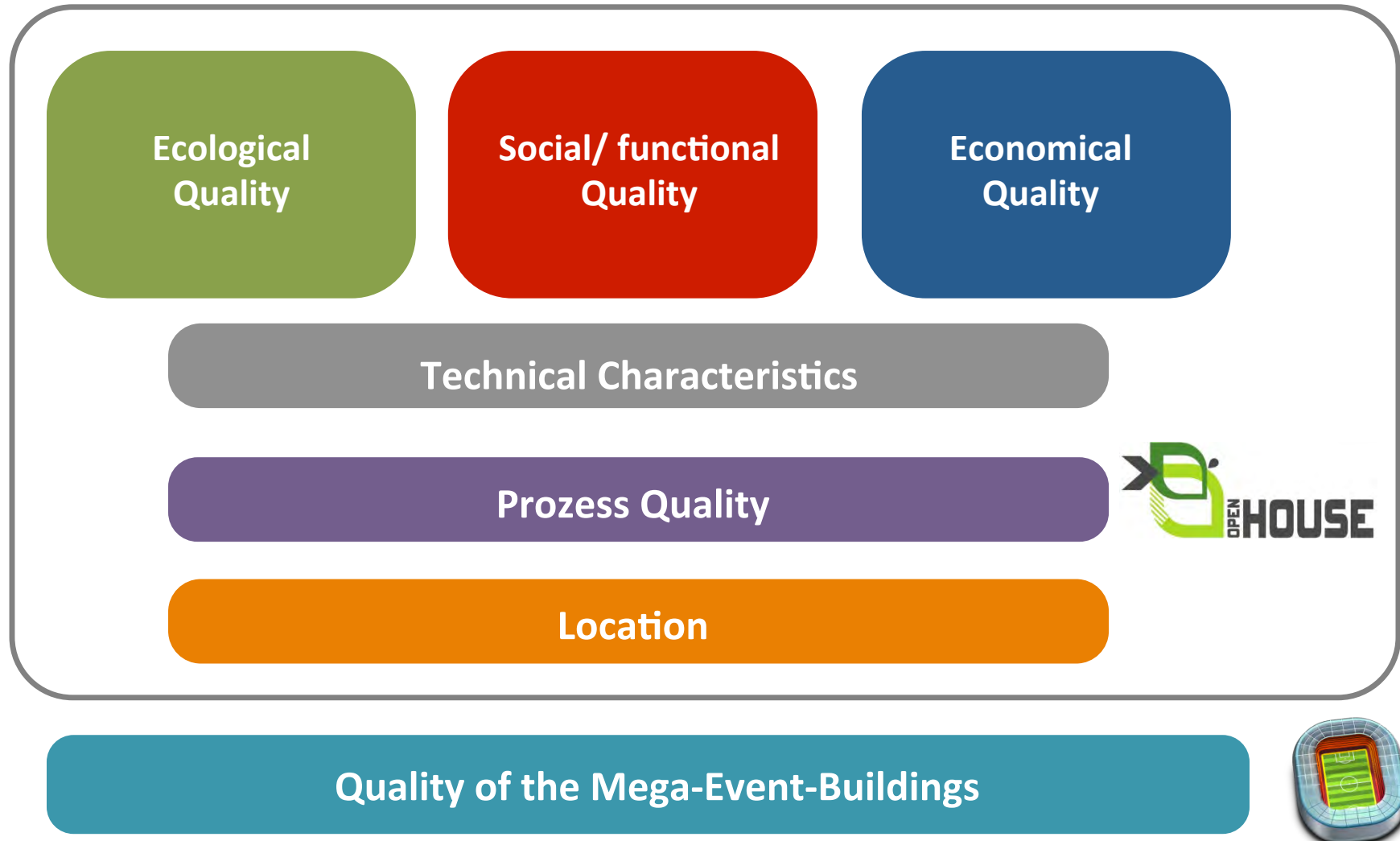
# Contents of Sustainable Buildings

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## Integral Planning



### Sustainability Assessment Method for Mega-Event-Buildings



# Anpassung der OPEN HOUSE Methode an die Gebäudetypologie Stadion

## Ökologische Ziele

**Ecological Quality:** Energy, Life Cycle Analysis (LCA), Water, Materials, Area Consumption, Recycling etc.

5. Abfallmanagement

**Social/ Functional Quality:** Comfort, Health, User, Barrier Free Accessibility, Architecture, Design etc.

8. Behaglichkeit

9. Gesundheit

**Economical Quality:** Life Cycle Costs, Economic Efficiency etc.

12. Verantwortungsvolle Materialbeschaffung

**Technical Quality:** Fire Protection, Accoustics, Building Shell, Deconstruction, Maintenance etc.

14. Qualität der Technischen Gebäudeausrüstung

15. Rückbaubarkeit, Recyclingfreundlichkeit, Demontagefreundlichkeit

**Process Qualität:** Masterplanning, Integral Planning, Tender Process, Construction Site, Monitoring etc.

18. Integration von Nachhaltigkeitsaspekten in die Ausschreibung und Vergabe

19. Nachhaltiges Baustellenmanagement

**Location:** Micro Site, Risks, Transport etc.

## Großveranstaltungsspezifische Ziele

21. Integration der Olympischen Baumaßnahmen in das bestehende Stadtgefüge

**Quality of the Mega-Event-Building:** Integration into the existing urban structure/ district, re-use, sportfunctional aspects, temporary and existing buildings etc.

23. Förderung von Nachhaltigkeitsmaßnahmen in der Nutzung und Weiterentwicklung (z.B. durch Nutzer, Bauarbeiter etc.)

## Buildings of Mega-Events: CO<sub>2</sub>-Emissions

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### CO<sub>2</sub>-Calculation of Mega-Events – Without Re-Use

- **Turin 2006:** 120.000 Tons of CO<sub>2</sub> (Buildings) (Global Forum for Sports and Environment 2006)
- **Beijing 2008:** 1.189.100 Tons of CO<sub>2</sub> (Buildings and travelling) (UNEP 2009: S.105)
- **Vancouver 2010:** 300.000 Tons of CO<sub>2</sub> (Buildings and travelling) (Vancouver 2010 2009)
- **London 2012:** 3.400.000 Tons of CO<sub>2</sub> (Buildings and travelling) (UK Government 2009)

#### Example (Timeframe: 7 years):

1.700.000 Tons of CO<sub>2</sub>: Construction Venues, Olympic Village and Park („**Embodied Energy**“)

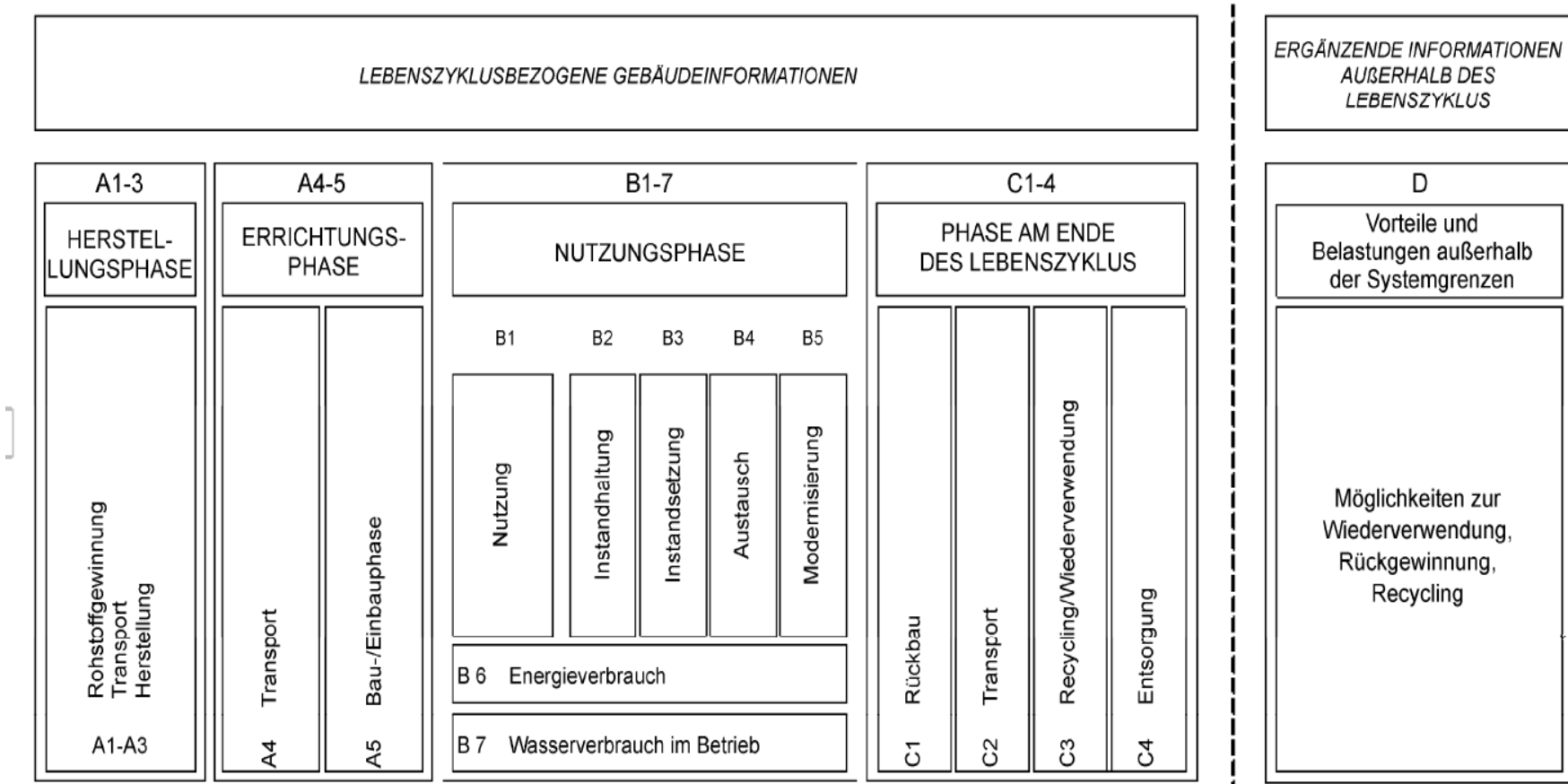
15.000 Tons of CO<sub>2</sub>: Energy Demand of the Venues during the Games

1.685.000 Tons of CO<sub>2</sub>: Travelling, Infrastructure, Catering und Temporary Facilities

**Problem: Different instruments, calculation and data basis – no comparison possible!**

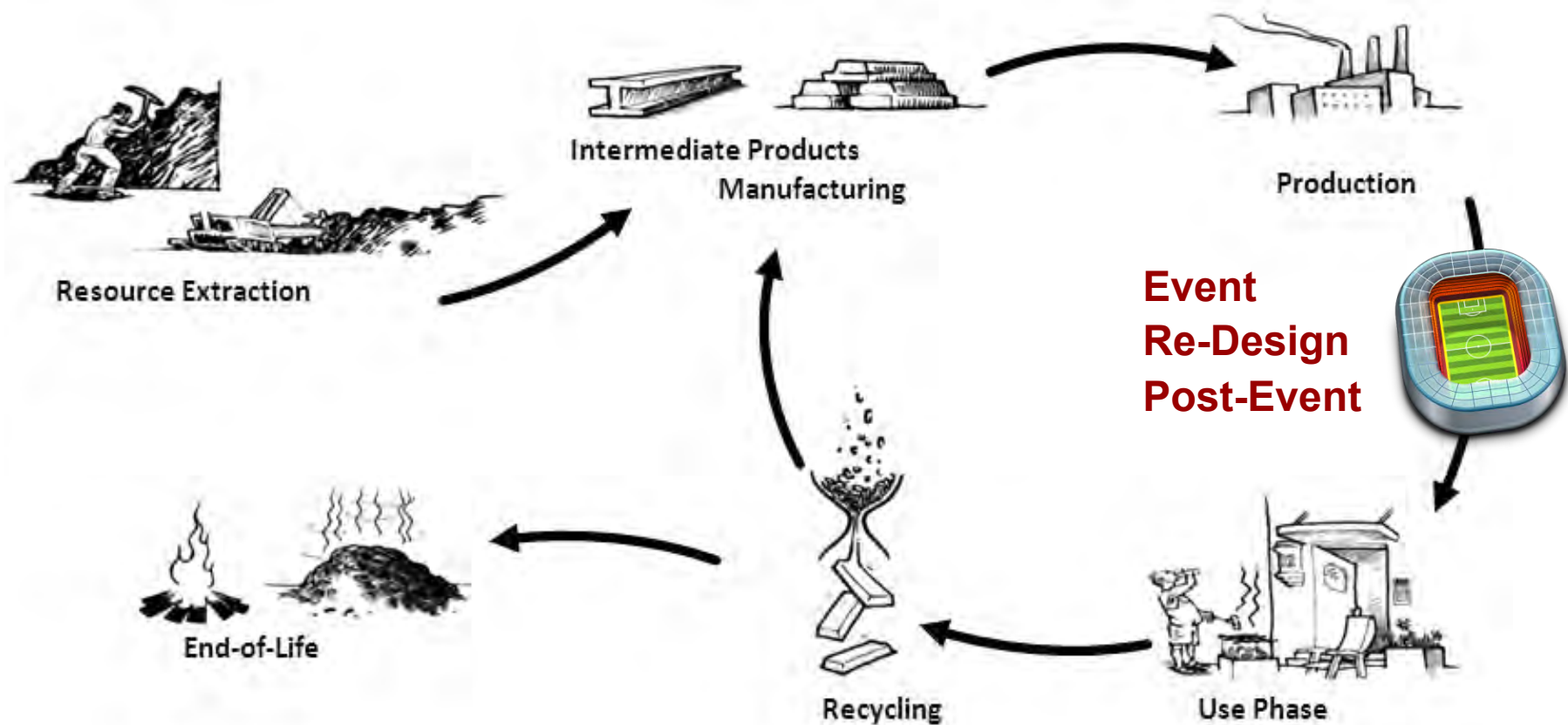
# Life-Cycle of Buildings: Construction, Operation and Demolition

## Life Cycle of Buildings based on prEN 15978



# Lebenszyklusanalyse

## Lebenszyklus von Gebäuden und Bauprodukten



## Research: EM 2012 Poland, National Stadium Warsaw

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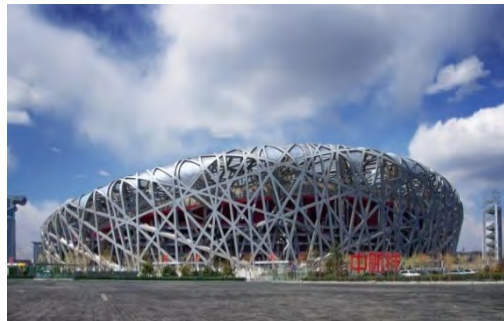
### Comparison: National Stadium Warsaw with stadia of the „Carbon Footprint-Study“

**LCA: National Stadium Warsaw in cooperation with „gmp architects“**



**National Stadium Warsaw**

### Stadia of the „Carbon Footprint-Study“ of the Olympic Games of London 2012



**National Stadium Beijing 2008**



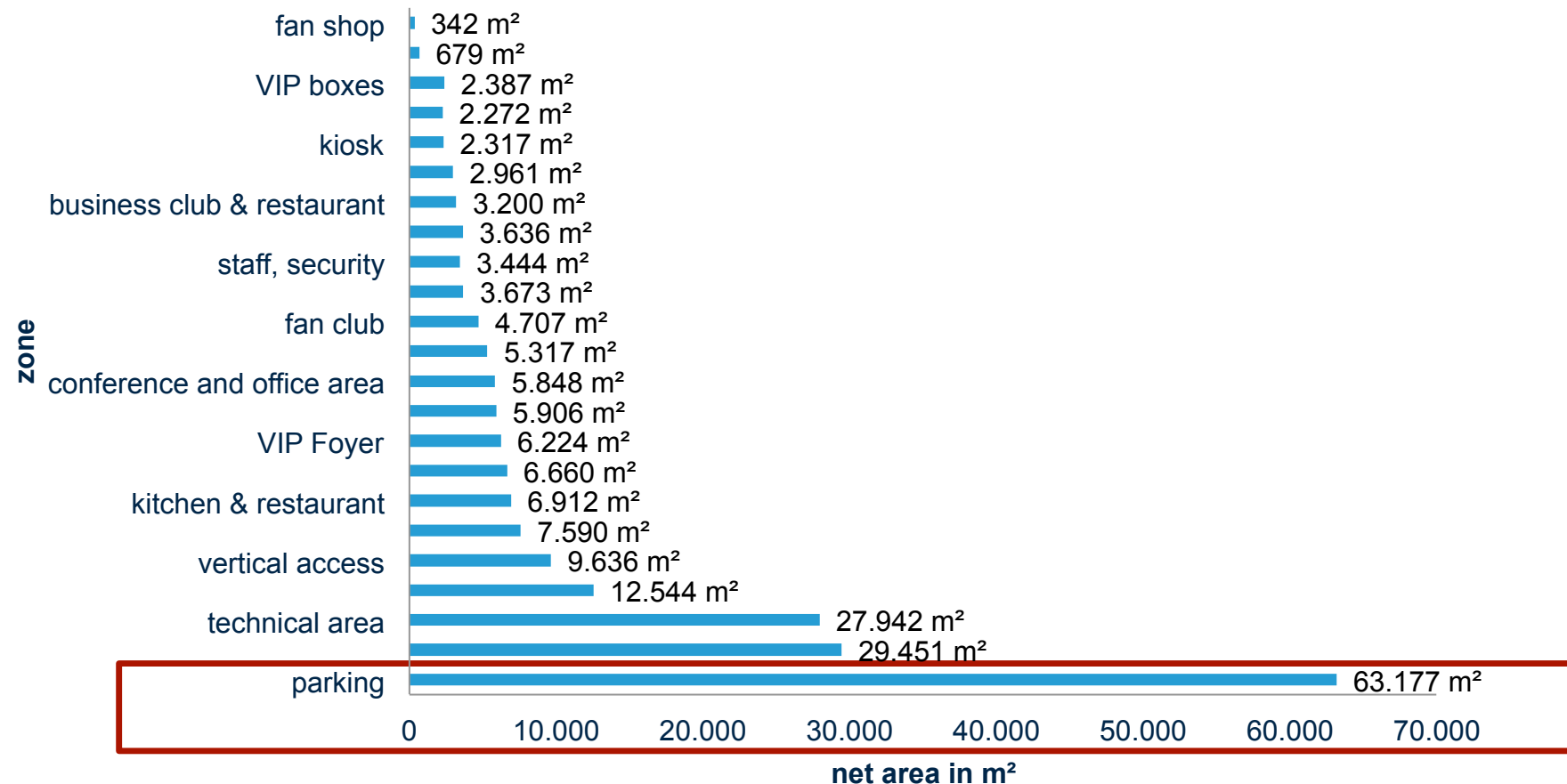
**Olympic Stadium London 2012**



**Stadium Australia Sydney 2000**

# Buildings of Mega-Events: Life-Cycle-Analyses (LCA)

## Database: Surface Area – Example National Stadium Warsaw

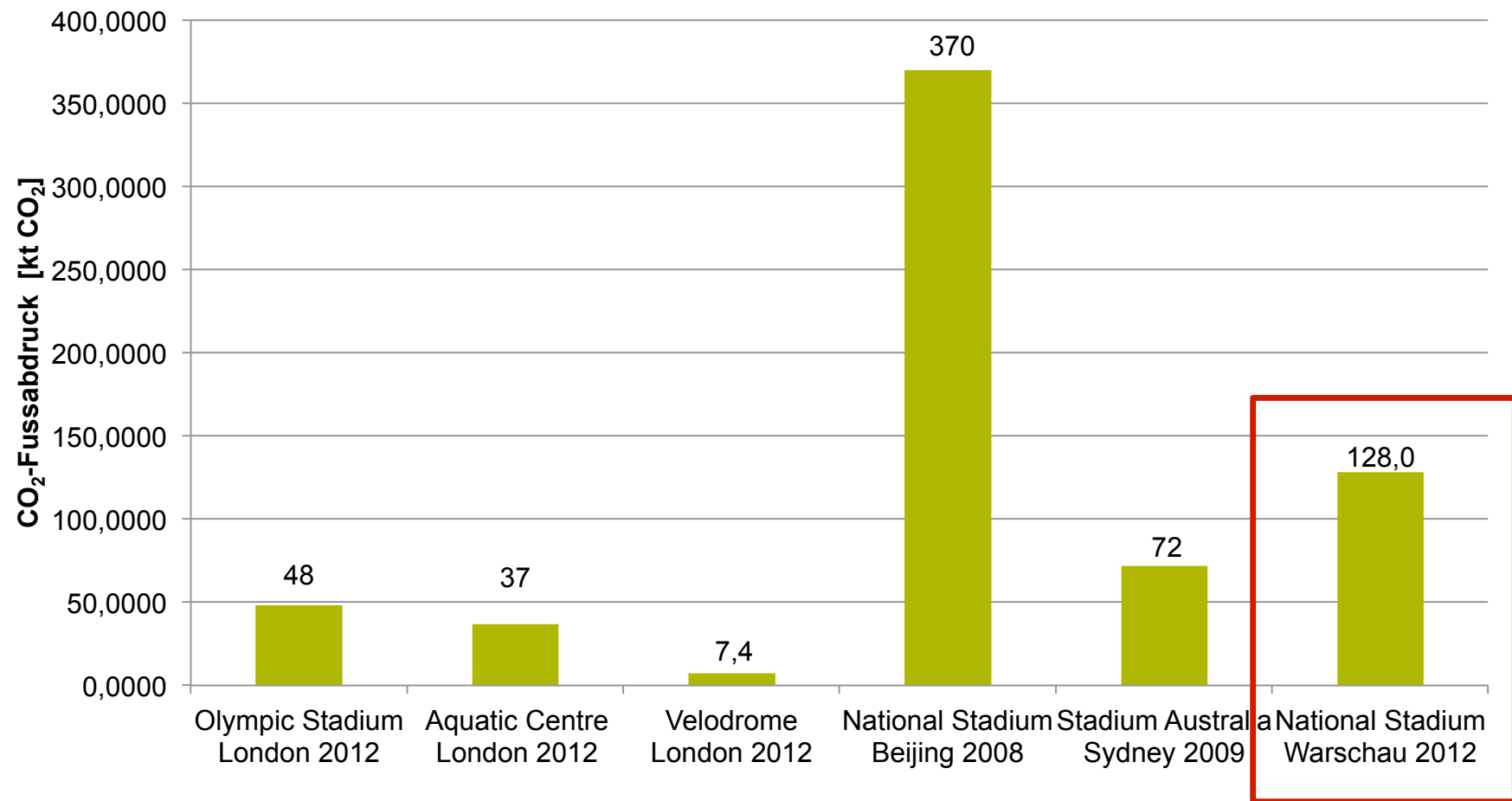


**Problem: What surfaces have to be integrated into the calculations? Netto – brutto: no definition is given!**

## Buildings of Mega-Events: Life-Cycle-Analyses (LCA)

### Comparison CO<sub>2</sub>-Footprint:

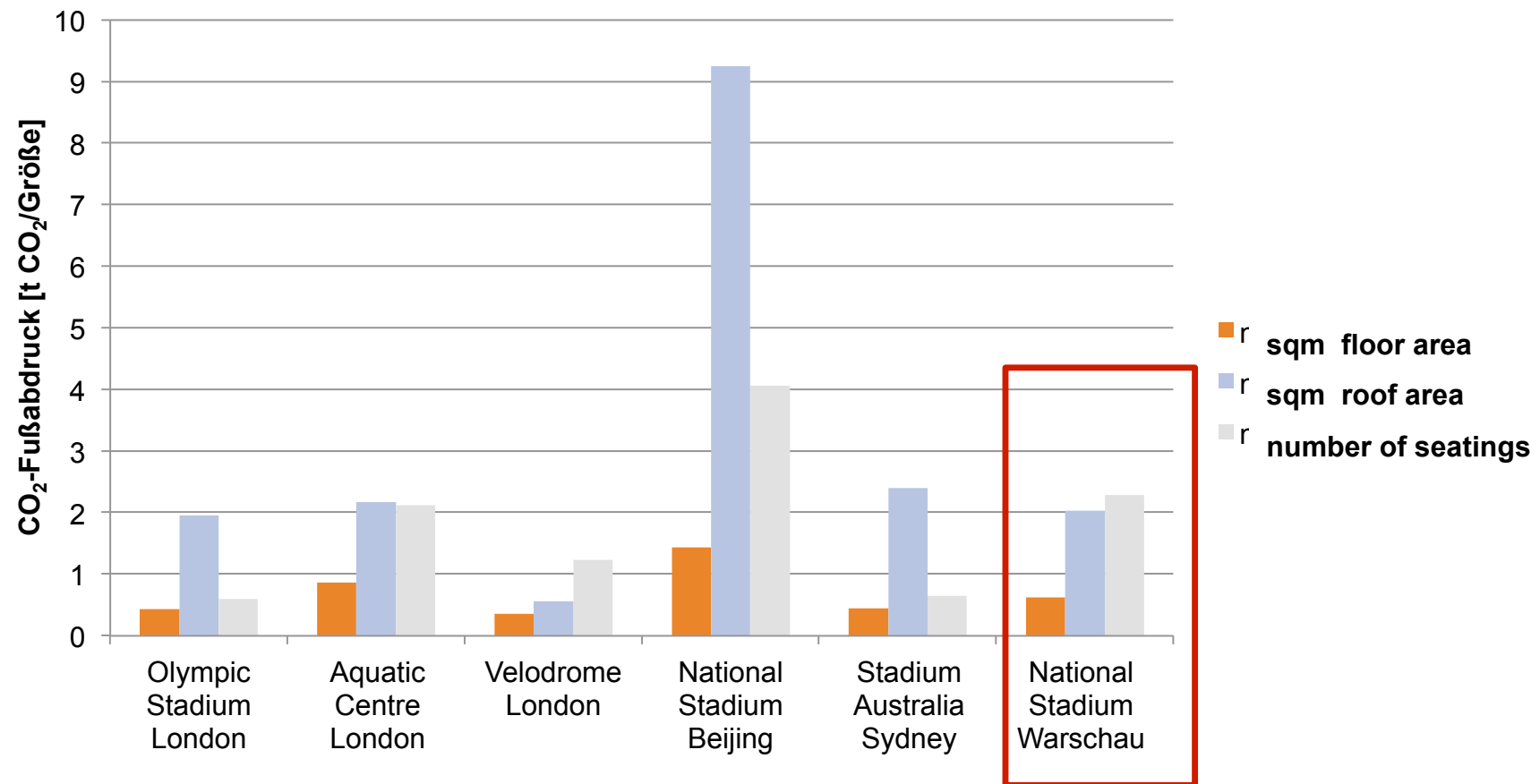
### Stadia of „Carbon Footprint“ - Study with the National Stadium Warsaw



**Problem: No comparison possible in regard to different calculation parameters, databasis and included builded structures – Common structure is needed!**

## Buildings of Mega-Events: Life-Cycle-Analyses (LCA)

### Comparison CO<sub>2</sub>-Footprint (different Reference Plane): Stadia of „Carbon Footprint“ - Study with the National Stadium Warsaw



**Problem: No comparison possible in regard to different calculation parameters, databasis and included builded structures – Common structure is needed!**

# Common Sustainability Standards for Mega-Event Buildings

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## Criteria: Design for All



National Aquatic Centre (Beijing 2008)

## Example: Olympic Games Beijing 2008

First Olympic Mega-Event where all the Olympic and Paralympic Games have been held in the same Venues

# Common Sustainability Standards for Mega-Event Buildings

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## Criteria: Water and Waste Water



### Example: Telstra Stadium Sydney (Olympic Stadium 2000)

Use of rain water and water treatment

4 Water tanks á 800 000 litre, integration into the water system of the Olympic Park

# Common Sustainability Standards for Mega-Event Buildings

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## Criteria: Multifunctionality

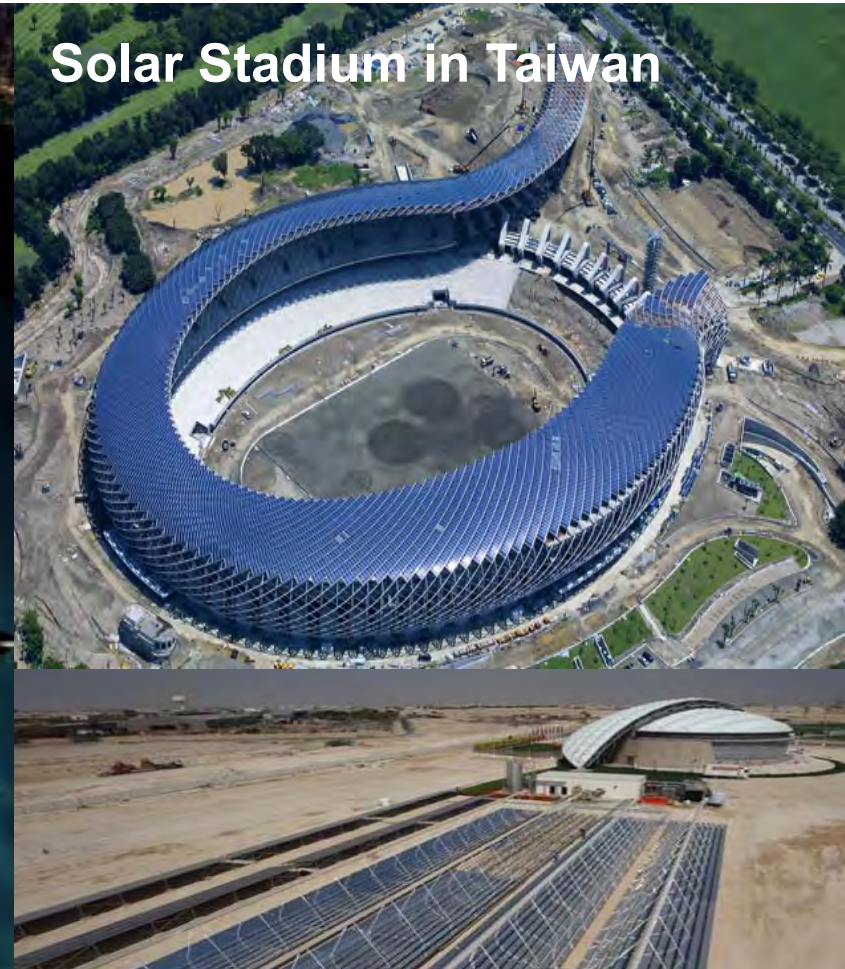
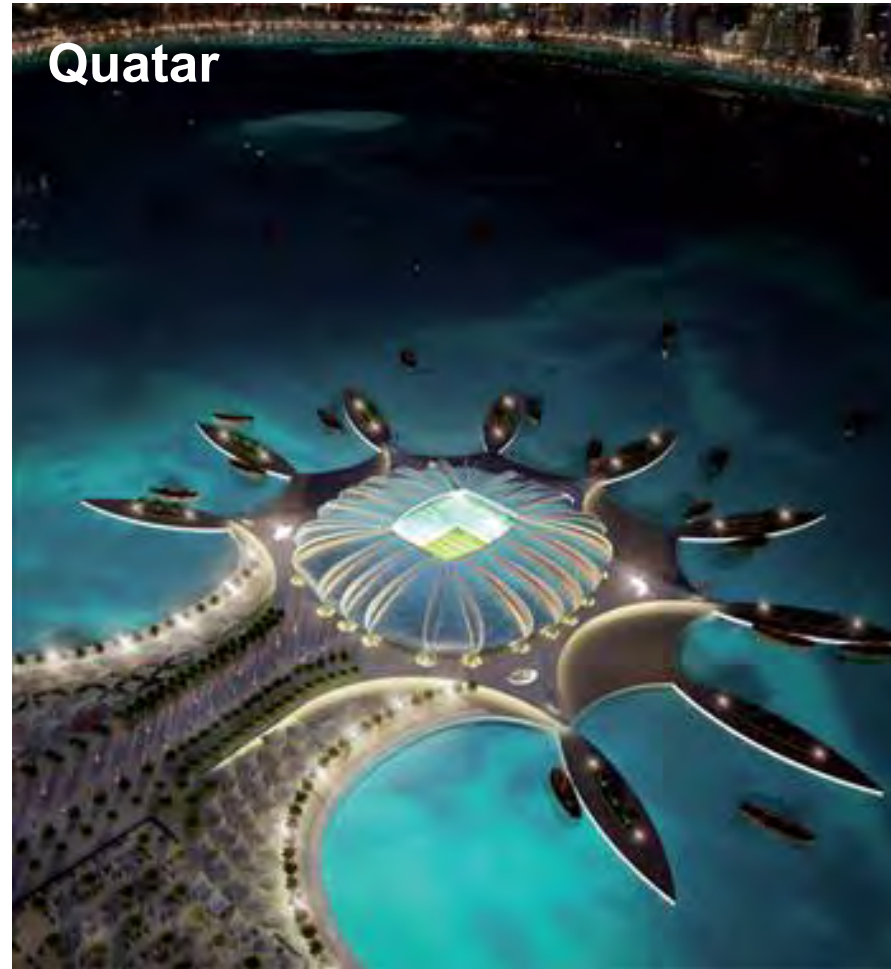


### Example: Audi Dome Munich (2013)

Conversion of the Audi Dome as a congress hall for the sustainable building conference „sb13 munich“ (April 2013)

## Common Sustainability Standards for Mega-Event Buildings

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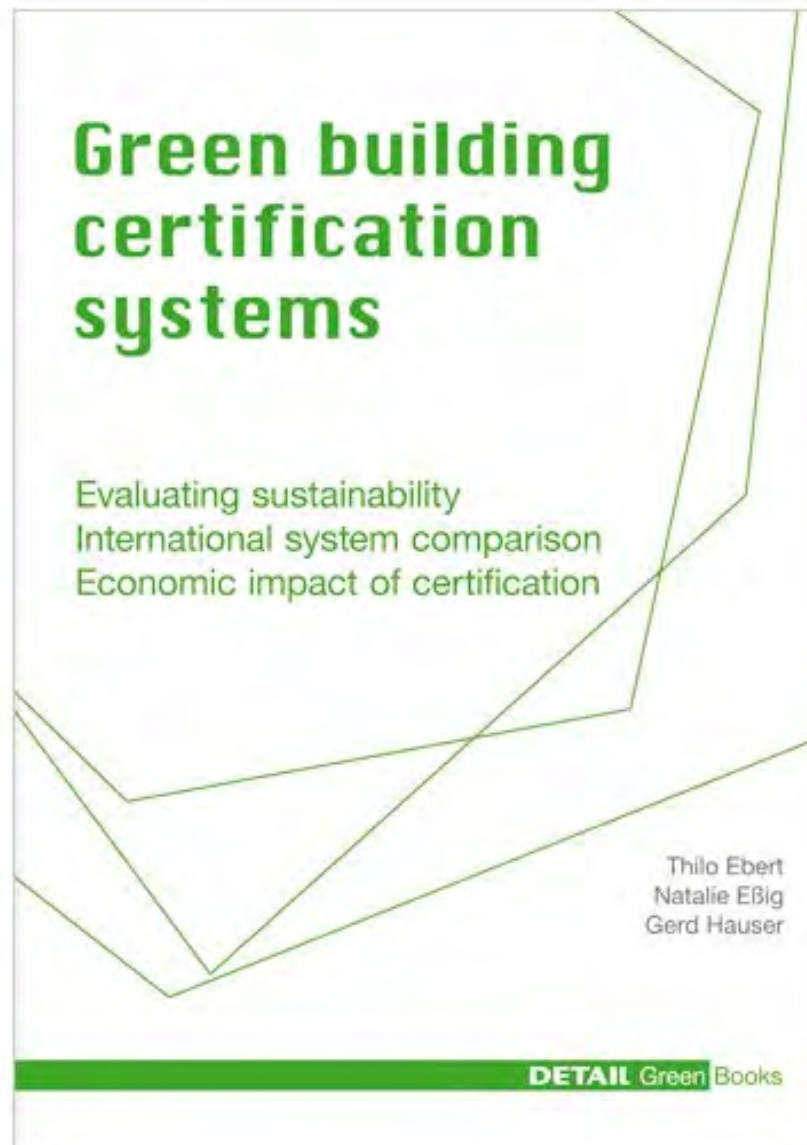
### FIFA World Cup 2022 in Qatar

Solar powered venues, example Doha Port Stadium

Modell stadium (ARUP): 1.400 sqm of solar collectors for the cooling of 500 seats

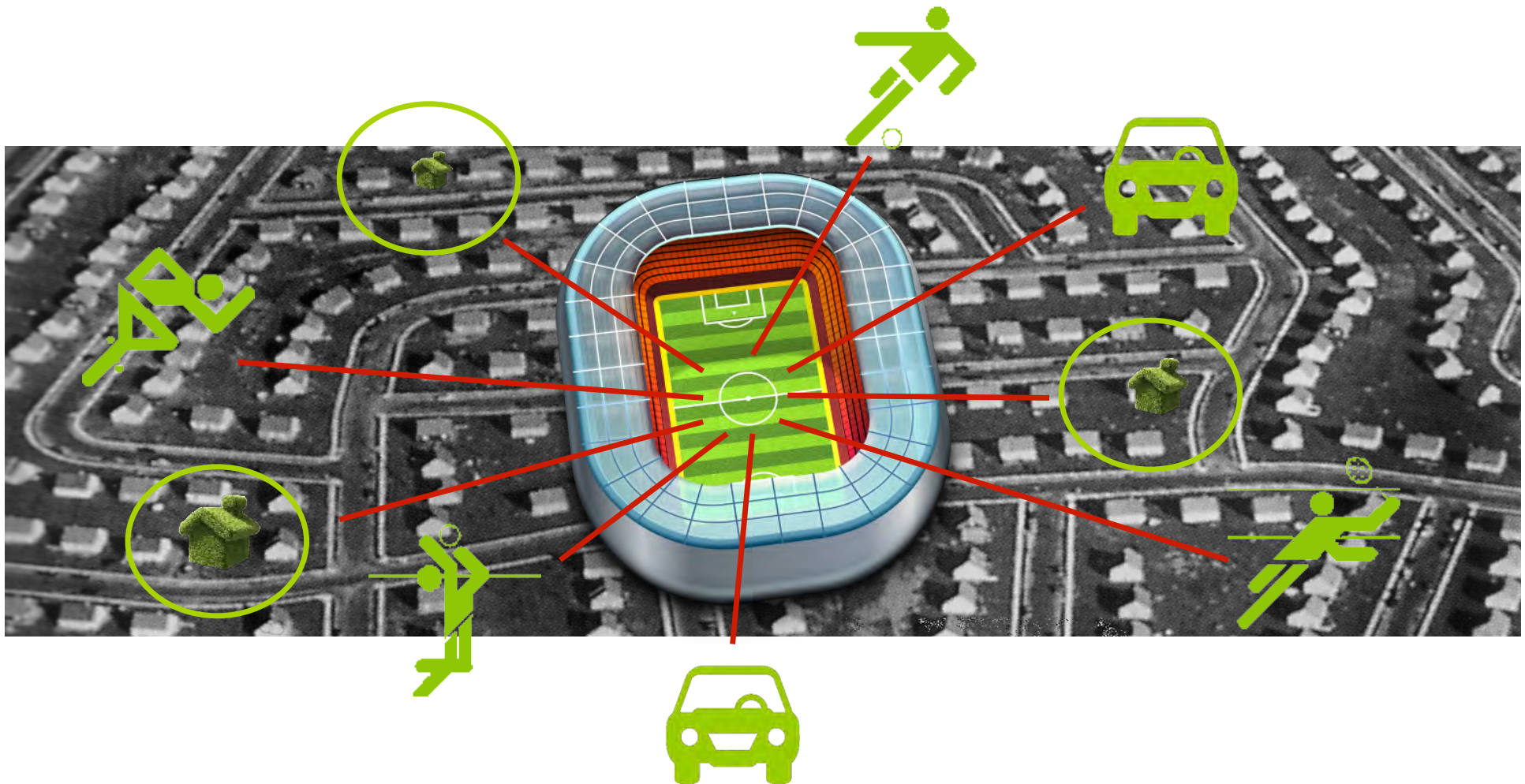
## More

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# Stadium of the Future

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## Aktivhaus + Stadium

Interaction with the infrastructure of the city district/ neighbourhood – provider and storage of energy